American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS)

ISSN (Print) 2313-4410, ISSN (Online) 2313-4402

http://asrjetsjournal.org/

Data Envelopment Analysis on Efficiency of Insurance Companies in Ethiopia

Ashagrie Sharew[a]*, Gizachew Fentie[b]

[a]*Department of Statistics Debre Markos University, Debre Markos, Ethiopia*

[b]*Ethiopia Insurance company, Debre Markos, Ethiopia*

[a]*Email: statashe@gmail.com*

Abstract

Competition in the economy can create a positive prospect for economic growth and development of a country. Competition in Ethiopian financial sector in general and insurance industry in particular should be strong enough for enhancement of efficiency, provision of better service to customers, greater innovation and lower prices thus resulting in improvement of consumers welfare and overall economic growth of the country.This research is developed to conduct a study to empirically assess the efficiency of the insurance companies in the Ethiopian insurance industry. Data Envelopment Analysis (DEA) approaches was used to measure the efficiencies of the insurance companies. The proposed study attempted to address (focus) on what is the efficiency of the insurance companies in Ethiopia? What factors affect their efficiency? In what mechanism the insurance companies in Ethiopia could improve or enhance their efficiency? These and other related issues have not been largely answered and not empirically supported in the Ethiopian context. In general the study seeks to find the determinants of the insurance companies' 'performance/efficiency'. In order to achieve this objective, the study used Panel data covering ten years period from 2006– 2015. The proposed study attempted to provide its contributions to the literature, policy, managerial and methodological implications. Based on the result Ethiopian insurance corporation and Nyala insurance company were relatively efficient taking first and second rank respectively. It was found that company size and number of branches were significantly affecting efficiency score at 95% confidence.

Key Words: Data envelopment analysis; Insurance company; efficiency; Ethiopia.

----

* Corresponding author.

1. Introduction

1.1 Background of the study

Insurance is an important and growing part of the financial sector in virtually all developed and some developing countries. A resilient and well-regulated insurance industry can significantly contribute to economic growth and efficient resource allocation through transfer of risk and mobilization of saving. In addition, it can enhance financial system efficiency by reducing transaction costs, creating liquidity, and facilitating economics of scale in investment [1]. According to UNCTAD [2] a sound insurance market is an essential characteristic of economic growth and there is a positive and strong correlation between the level of economic development and insurance coverage of a nation. The same literature has also emphasized on the strong alignment between insurance development and social, governance, cultural and macroeconomic factors such as inflation, currency, exchange rate, national income, regulations, supervision strategies, and other national objectives of a country. Now-a-days insurance is one of the cornerstones of modern day financial services sector. In addition to its traditional role of managing risk by indemnification, the insurance industry can promote long term savings and serves as a medium to channel funds from policy holders to investment opportunities including mortgage lending [3].

The insurance industry forms an integral part of the global financial market, with insurance companies being significant institutional investors. In recent decades, the insurance sector, like other financial services, has grown in economic importance. This growth can be attributed to a number of factors including, but not exclusively: Rising income and demand for insurance, Rising insurance sector employment, and increasing financial intermediary services for policyholders, particularly in the pension business[4]. Expanding on the link between GDP and insurance market development, it must be remembered that the insurance industry‘s primary function is to supply individuals and businesses with coverage against specified contingencies, by redistributing losses among the pool of policyholders. Insurance companies, therefore, engage in underwriting, managing, and financing risks.

The primary function of insurance is to act as risk transfer mechanism to provide peace of mind and protect against losses. Insurance is used as financial protection for a variety of personal and business purposes, such as, to protect income, repay debts, or provide for dependants. To minimize the loss that may result from death or serious disability, it is important to implement suitable protection strategies which insurance is one of the most widely used mechanisms. Insurance schemes utilize combination method to pool risks in to a large group to minimize overall risk that is mainly based on the law of large numbers [5].

Podpiera [6] Stated that insurance promotes financial stability through transfer and pool of risks, thereby encouraging individuals and firms to specialize, create wealth, and undertake beneficial projects that they would not otherwise consider. Insurance can play an important role in personal retirement planning and health insurance programs, and to that extent can reduce demands on government social security and health programs relieving pressure on government budget. Insurance may lower the total risk faced by an economy through risk diversification across border as well as to promote risk mitigation activities.

A well-functioning insurance sector enables efficient allocation of capital, mobilize and channel savings; support trade, commerce and entrepreneurship and improve the quality of lives of individuals in a given country by increasing social stability through, for example, individual health, life insurance, pension funds and worker's compensation; from a commercial service perspective, it promotes the domestic financial sector, becomes significant player in the capital market, and gives financial confidence for investments.

For financial institutions in general and the insurance companies in particular, efficiency implies improved profitability, greater amount of funds channelled in, better prices and services quality for consumers and greater safety in terms of improved capital buffer in absorbing risk [7].

According to [8] insurance is one of the recent service activities in Ethiopia. The Ethiopian insurance industry does not have a long history of development despite the country's long history of civilization. Although people have been using '*Edir*' and '*Ekub*' for ages in Ethiopia, insurance in its modern form can hardly be traced beyond the 1920's. Historically the first insurance business was transacted in Ethiopia by the Bank of Abyssinia which began operation in 1905 during the reign of *Minilik II* that served as an agent to a foreign company. Following the liberation of the country from the Italian occupation in 1941, during the Emperor *Hailessalssie's* regime, there were different private owned insurance companies. After the fall of the Emperor, in 1974, thirteen privately owned insurance companies were nationalized under the socialist regime of Ethiopia by proclamation No. 261 / 1975.

In general, resulting from an increase in competition, both on the national and international level, and other driving forces in the market such as deregulation, institutional setting, market structure, insurance firms and insurance markets are expected to become more efficient and more productive [9]. i. e inefficiency in insurance companies, which previously could not exploit their advantages due to a variety of reasons need to gain market share and realize economies of scale. Inefficient companies are forced to improve efficiency or they will be taken over by more efficient firms.

The analysis on the efficiency in the attainment of goals can be made by traditional methods or frontier based approaches. One of the frontier approaches is the Data Envelopment Analysis (DEA) technique. In this proposed study, a DEA based analysis of the efficiency of the insurance sector/industry had been conducted with the aim to fill the gap and help the sector's supervisors and companies' managers in managing and supervising the insurance companies and the insurance sector toward the optimal benefits has both academic and practical significance.

The significance of this study stems from the fact that more of studies in Ethiopia have investigated the analysis of efficiency only for non-financial and banking sectors. Therefore, the researcher believes that the study fills an important gap in understanding the determinants of efficiency for insurance companies in Ethiopia. Such an understanding is important, because it equips financial managers with applied knowledge for determining factors that affect firms' efficiency. From a theoretical point of view, it provides an important data for comparing determinants of efficiency of insurance companies involved in the country and an overall insurance industry.

Thus, the main research area of this study is concerned with efficiency measurement and analysis on the insurance sector and insurance companies in Ethiopia. Efficiency of the insurance companies and the insurance sector in Ethiopia is determined and compared, efficiency change over time is analysed and factors explaining differences in efficiency across companies and the sector over time have been studied. The study covered ten years data over a period of 2006 - 2015. Moreover, in order to provide insight information on the context about the insurance sector in the country during the stated period of time, descriptive and trend analysis on the operations, financial position and operating results of the insurance sector in Ethiopia is conducted.

1.2 Need for the study and research question

The insurance industry forms an integral part of the country‘s financial sector and its benefits cannot be over-emphasized. If this crucial sector was missing, the consequence on the economy would be devastating[10]. Insurance enables businesses to operate in a cost-effective manner by providing risk transfer mechanisms whereby risks associated with business activities are assumed by third parties. It allows businesses to take on credit that otherwise would be unavailable from banks and other credit-providers fearful of losing their capital without such protection, and it provides protection against the business risks of expanding into unfamiliar territory new locations, products or services which is critical for encouraging risk taking and creating and ensuring economic growth [4].

Efficiency in business management is a very useful tool in re-allocation of available resources in business environment with homogeneous products and with multiple units of inputs and outputs. Efficiently operating firms are able to minimize inputs used and maximize outputs produced and therefore remain competitive in the market [11]. Efficiency gives the general view of the firm’s performance and operational capability. This is mainly because it takes care of all operational related issues of such firms like supply chain management, quality management, employee motivation, product design, scheduling, layout, employee culture, inventory management, organizational structure and internal processes. Therefore, the management and improvement of the efficiency of an industry has to take into consideration all the factors affecting the operations of the firms. These factors need to be fully understood consolidated as they depend on each other and affect the operational performance of the firm [11]. Webb [12] argued that lack of competition and inefficient insurance regulation may increase the price of insurance without implying a high level of insurance consumption. A high degree of competition and efficiency in the insurance industry can contribute to great financial stability, product innovation, and access by households and firms to financial service, which can in turn improve the prospects for economic development of a country.

The evaluation and analysis of the efficiency/performance of the insurance companies enables to understand the existing situations of the insurance industry in the country and take remedial actions according to the findings and results of the analysis. Unless and otherwise the service is managed properly, where one very important perspective of this is efficiency, the insurance industry have the potential to generate financial system and macroeconomic instability. The cost of financial systems and macroeconomic instability to the general public and the government is significant. It is essential to ensure safety, soundness and stability of the financial sector by having a comprehensive management, legal framework and supervision of the sector’s business and its part in which one sub-sector is the insurance industry consisting of primarily the insurance companies.

This study addressed the issue using an alternative frontier approach which is DEA. Therefore, as empirical studies on the state of cost efficiency in the Ethiopian insurance industry are very scanty, this study addressed and seeks to answer the following specific research questions:

- ***i.*** What are the comparative standing and over time trends in the efficiency score of the individual insurance companies and the insurance sector in Ethiopia?
- ***ii.*** What are the determinant factors that affect the efficiency of the Ethiopian insurance companies and the insurance sector in Ethiopia?
- ***iii.*** What are the remedial actions/suggestions that demand the insurance companies and the insurance sector in Ethiopia to improve their cost efficiency?

1.3 Objective of the study

The main objective of this research was to assess and analyze factors affecting the efficiency of the insurance companies in Ethiopia. The ultimate goal of the study is to understand the cost efficiency dynamics of the insurance companies, the relationship of companies' cost efficiency and the different company specific characteristics in the Ethiopian insurance sector. The specific objectives of the study based on the general objective and the research questions set above are formulated as follows:

- i. To measure and conduct benchmarking analysis of the efficiency of insurance companies in Ethiopia based on their efficiency scores.
- ii. To identify major factors affecting the efficiency of insurance companies in Ethiopia.
- iii. To recommend on the financial and operational issues demanding improvements on the Ethiopian insurance companies.

1.4 Scope of the study

The scope of the study is limited in terms of content, time and methodology. Basically, it analyzed the efficiency of a sample of insurance companies in Ethiopia. Panel data for a period of ten years (2006-2015) were used. A non-parametric frontier approach based Data Envelopment Analysis (DEA) technique and regression models were employed in the measurement and analysis of the efficiency of the insurance companies and the insurance sector in Ethiopia.

2. Materials and Methods

2.1 Data type and source

The quality of any research depends on accessibility and credibility of data. Therefore, it is very important to give due attention in collecting necessary data from appropriate sources.

In achieving the objectives and obtaining answers for research questions, the study adopted quantitative method research approach. The method adopted consists of the survey on the practices of the insurance business in the country to gather additional information on financial statements of individual insurance companies to supplement the secondary data collected. With regard to the survey, the target population consists of nine insurance companies. The number of total insurance companies under study is nine and observation is also for ten years and then ten times nine, becomes ninety total observations were included.

For the purpose of this research secondary data was mainly used and collected from the audited annual accounts, financial statements and reports of the Ethiopian insurance companies and obtained from National Bank of Ethiopia (NBE) for the period covering 2006 to 2015.

2.2 Sampling techniques and sampling units

Currently, there are seventeen insurance companies in the Ethiopian insurance sector (one state owned and sixteen private insurers). Those insurance companies which have been operating in the Ethiopian insurance market for a minimum of ten years as of end of June, 2015 had been included in the analysis. Those insurance companies which are dormant or in the process of starting up or closing down their operations are excluded from the analysis. Based on these criteria, nine out of the seventeen insurance companies in the country were purposively selected and included in the sample. These include one state owned insurance company- the Ethiopian Insurance Corporation (EIC) and eight private insurance companies. The nine sample insurance companies in the Ethiopian insurance sector for which efficiency scores were determined and analysed in this study were included in table 1.

Table 1: Sample Insurance companies and their year of establishment

No	Name	Establishment date
1	Ethiopian Insurance Corporation	1975
2	Africa Insurance Company	1/12/1994
3	Awash Insurance Company	1/10/1994
4	Global Insurance Company	11/1/1997
5	NIB Insurance Company	1/5/2002
6	Nile Insurance Company	11/4/1995
7	Nyala Insurance Company	6/1/1995
8	United Insurance	1/4/1997
9	National Insurance Company of Ethiopia	23/09/1994

Source: www.nbe.org.et

2.3 Data analysis technique and Model specification

In the study, a two-step analysis were employed. In the first step the efficiency scores/values were first calculated/ estimated, and in the second step, the study employed regression analysis in finding and examining possible factors of the efficiency scores. A data envelopment analysis(DEA) model with multiple outputs and inputs based efficiency measurement was used. Data Envelopment Analysis (DEA) is a method which is used to measure the efficiencies of decision making units(DMUs) with multiple inputs and outputs. It calculates weights to the inputs and outputs by assigning the maximum efficiency score for a DMU under evaluation. Due to its ability to handle the censored data, which are typically bound between 1 and 0, the Tobit model was used in the study to analyse the potential factors affecting the efficiency of the Ethiopian insurance companies during the period under review. Here under, definition of the variables and expected relationships between variables hypotheses and the specification of the model are addressed and presented.

2.3.1 The DEA model to measure efficiency

The measurement of efficiency is mostly focused on two different approaches, namely the parametric and non-parametric methods. The most commonly used parametric approaches are the Stochastic Frontier Approach (SFA), Distribution Free Approach (DFA) and the Thick Frontier Approach (TFA). The most commonly used non-parametric approaches are the Data Envelopment Analysis (DEA) and the Free Disposable Hull (FDH) [9].

This study measured the technical efficiency and its component efficiency scores like pure technical and scale efficiencies of the insurance companies in Ethiopia. The most important issue in measuring efficiency is the technique one has to employ to measure the efficiency scores of the decision making units included in the study, the insurance companies in the current context.

For the purpose of estimating the various measures of efficiency of the insurance companies in Ethiopia, a non-parametric technique called data envelopment analysis (DEA) model, was used. DEA is the most widespread mathematical programming approach, first introduced by Charnes[13]. The model employs linear programming to construct an efficient frontier that envelopes all in the technical efficiency of a firm is achieved by maximizing production with the quantity of productive factors used. The index of technical efficiency is defined as the quotient between the level of production achieved and the maximum that a firm could achieve by being efficient input-output combinations of firms in the sample where the efficient ones are situated on the envelope.

Technical inefficiency of a production unit has two components one due to 'pure' technical inefficiency (i.e., VRS TE) and the other due to scale inefficiency. The differences of CRS and VRS are due to scale inefficiencies. Following [13] the basic DEA models for measuring technical efficiency are specified as follows.

a) **Overall Technical Efficiency**: The overall technical efficiency indicates the quantity of inputs that could be reduced without affecting the output levels of a decision making unit, the insurance companies in the current context. The overall technical efficiency of the insurance companies is measured using the Charnes, Cooper and Rhode (CCR) DEA model which takes the constant return to scale (CRS) assumption into account [13].The model is:

$$\text{Max } E_m = \sum_{j=1}^{J} \mathrm{V_{jm}}\,\mathrm{Y_{jm}}$$

Subject to

$$\sum_{j=1}^{J} \mathrm{V_{jm}}\,\mathrm{Y_{jm}} - \sum_{i=1}^{I} \mathrm{U_{im}}\,\mathrm{X_{in}} \le 0, \text{ for all i}$$

$$\sum_{i=1}^{I} U_{im} X_{in} = 1 \text{ (to move from ratio to linear programming form)}$$

Where,

E_m= technical efficiency of the m^{th} decision-making unit (DMU).

Y_{jm}= the j^{th} output of m^{th} decision-making unit (DMU).

V_{jm}= the weight of j^{th} output of m^{th} decision-making unit (DMU), MFI.

X_{im}= the i^{th} input of m^{th} decision-making unit (DMU).

U_{im}= the weight of i^{th} input of m^{th} decision-making unit (DMU).

$V_{jm}, U_{im} \geq 0$; i=1,2,…,I; j=1,2,...,J.

b) Pure Technical Efficiency: The pure technical efficiency indicates the extent of overall inefficiency that is caused by managerial inefficiency or wastage of resources without scale effect. The pure technical efficiency of the insurance companies is measured using the Banker, Charnes and Cooper (BCC) DEA model which assumes the variable return to scale (VRS) to give consideration for companies' differences in scale sizes[14]. The model is:

Min θm

Such that $Y\lambda \geq Y_m$, $X\lambda \leq \theta X_m$

Where, $\lambda \geq 0$; θm is free or unconstrained; $\sum_{n=1}^{N} \lambda_n = 1$; This convexity constraint is added for VRS by making modification in CRS; Y = vector of outputs of all DMUs/Micro finance institutions and Ym is the output of the mth DMU, which is the reference DMU; θ is the dual variable corresponding to the equality constraint that normalizes the weighted sum of inputs and λ is the dual corresponding to the other inequality constraint of the primal (CCR Approach).

c) Scale Efficiency/ Scale Efficiency (SE) Ratio

Scale efficiency (SE) measures the extent of overall inefficiency that is caused due to wrong choice of scale of insurance companies operation. The scale efficiency of the companies is estimated by dividing the efficiency scores of the institutions obtained using the CCR model in (a) to the scores obtained using the BCC model in (b) i.e. by dividing the TE of CRS by the TE of VRS (SE = TECRS/TEVRS).

2.3.2 Selection and definition of inputs and outputs

The use of DEA model in measuring efficiency of decision making units requires selection of appropriate input and output variables. However, there is no consensus as to the selection of the inputs and outputs of financial institutions in general and the insurance companies in particular in the efficiency measurement and analysis literature. In empirical works, selection of inputs and output for financial institutions is mainly based upon two different approaches – intermediation approach and production approach.

Inputs

i. Total expenditures (X_1)
ii. Total assets(X_2) including both fixed asset and current asset

Outputs:

i. net profit after tax (Y_1):
ii. Total Premiums (Y_2)

2.4 Models for analysis of efficiency determinants

2.4.1 Tobit regression

In order to determine which factors can affect the efficiency scores of the Ethiopian insurance companies, efficiency scores were regressed on a set of the explanatory variables. To perform the regression analysis, the explanatory variables are considered as independent variables.

Following from previous studies, the following empirical model was employed and estimated using panel data of nine sample insurance companies in Ethiopia to be included in the analysis over the ten years in the study period.

$$CEFF_{it} = \beta_1 + \beta_2\,(SIZE_{it}) + + \beta_3\,(BRANCH_{it}) + \beta_4\,(AGE_{it}) + \beta_5\,(CAPITAL) + U_{it}$$

Where, t and i denote year and insurance company, respectively. CEFF represents the efficiency scores obtained in the first stage of the study. The dependent variable cost efficiency (CEFF) measure ranges from 0 to 1. $\boldsymbol{\beta}_1$ Is the constant/intercept term, $\boldsymbol{\beta}_2$ - $\boldsymbol{\beta}_5$ are coefficients and $U_{it}$is the disturbance/error term. All the other variables are as defined in the next section.

2.4.2 Definition of variables

The objective of the second phase of this research is to determine whether firm efficiency appears to be related to certain exogenous factors. In the model, the dependent variables are the scores of efficiency of the insurance companies to be computed/estimated in the first phase of the study. The explanatory/independent variables identified and included in the regression analysis model are: (1) Economies of Scale – Size (SIZE), (2) Ownership forms (OWNER) (3) Financial leverage/capital structure (CAPITAL), (4) Number of Branches (BRANCH), (5) Age (AGE). In relation to each of the variables identified the following hypotheses were developed and was tested.

a. Economies of Scale – Size (SIZE)

Performance is likely to increase in size, because larger firms will have better risk diversification, more economic scale advantage, and overall better cost efficiency. In this study, total asset is used as a proxy for Company Size.

b. Capital Structure/Financial Leverage (CAPITAL***):-*** It is a financial ratio that indicates the percentage of a firm's assets that are financed with debt. The Leverage Ratio is measured as:

Leverage Ratio= Total Liabilities/Total Assets

c. Branches (BRANCH)

d. Age (AGE):- This variable is measured as the number of years from date of establishment.

3. Results and Discussion

This section presented and discussed the findings from data analysis under taken in line with the objectives of the study. The data used were provided by national bank of Ethiopia which consisted of the performance of 9 insurance companies (both government and private) which were operating for the last 10 years (2006-2015). The research findings and discussions focused on correlation analysis of input and output variables, relative operational efficiency of insurance firms and related factors associated with efficiency of each insurance.

Even if 17 insurance companies are currently under operation, the study used nine of them. Because all other insurance companies were not as aged as the selected insurance firms.

3.1 Correlation Analysis of Chosen Output and Input Variables

Measures of relative operational efficiency assume that there is a positive relationship between the chosen outputs and chosen inputs. The analysis began by conducting an output-input correlation analysis between each output variable and each input variables. Table 2 summarized the findings of the analysis.

Table 2: Input-output correlation matrix

Input		Output variables	
		Net profit after tax	Gross written premium
Total expense	Pearson Correlation	0.902**	0.946**
	Sig. (2-tailed)	0.000	0.000
Total asset	Pearson Correlation	0.910**	0.977**
	Sig. (2-tailed)	0.000	0.000

Since DEA model was used in this study, two input and two output variables were used in which total expense of firms (insurances) and total asset of firms were considered to be input variables and net profit after tax and gross written premium were considered to be output variables.

From the table we see that there was a strong positive relationship between input and output variables where this relationship was not a mere of chance. A two tailed t-test with null hypothesis of correlation between input and output variables was zero showed us there was significant relationship at 99% of confidence.

3.2 Relative operational Efficiency scores

The result in section 3.1 confirmed that the data were suitable to measure relative operational efficiency. Ninety observations (10 years data from 9 firms) were collected and coded into SPSS version 20 then imported into STATA version 13. The DEA analysis was run through STATA version 13 where the output in each year were depicted in the Appendix. The study used output orientation model with constant and variable returns to scale. Output orientation model looks at the amount by which outputs can be proportionally expanded with inputs held fixed. The ultimate goal of any business firms is to maximize outputs with a given inputs and this study tried to look at the relative operational efficiency of each firm in terms of maximizing outputs with fixed inputs rather than looking at minimizing inputs with fixed outputs. In this study 9 insurance companies operated in Ethiopia were taken as DMU in order to evaluate their relative performance in terms of output variables (net profit after tax and gross written premium). On account of comparison years 2006-2015 were used. Input and output variables were taken from financial reports of insurance companies

Table 3 shows result of efficiency score based on constant returns to scale.

DMU1= Ethiopia insurance company, DMU2=Africa insurance company DMU3=Awash insurance company, DMU4= National insurance company DMU5= Nyala insurance company DMU6=Nile insurance company DMU7=United insurance company DMU8=Global insurance company DMU9=Nib insurance company

Table 3: CCR Efficiency Scores (2006-2015) output oriented.

DMU	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	average	rank
DMU 1	.8542	1	1	1	1	1	1	1	1	1	0.9863	1
DMU 2	.8247	.7158	.8044	.9109	.8635	.8001	.7872	.6687	.7453	.7811	0.7902	6
DMU 3	.5773	.9869	1	1	.8307	.5838	.6704	.5655	.8024	.8520	0.7869	8
DMU 4	.6965	.6114	.7432	.9159	1	.9269	.8503	.6314	.7531	.7468	0.7875	7
DMU 5	1	.7467	1	1	1	1	1	1	1	1	0.9747	2
DMU 6	1	1	.6832	.7376	.6828	.7171	.7742	.6361	.7030	.6721	0.7606	9
DMU 7	1	.9534	1	.9902	.8851	1	1	1	1	.5968	0.9425	3
DMU 8	1	.9336	.8589	1	.9544	1	1	.7701	.8164	.7039	0.9037	4
DMU 9	.9548	1	1	.927	.9057	.8440	.8336	.7415	.8163	.9510	0.8974	5

As shown in the table 3 DMU1 was CCR efficient from 2007-2015 but was not in 2006. DMU3 was CCR efficient in 2008 and 2009 but it was inefficient in the remaining years. DMU4 was inefficient in all years except 2010 while DMU5 was efficient except in 2007. DMU6 was efficient in 2006 and 2007 but was inefficient in recent years. DMU7 was least efficient in 2015 that it could increase its output by 40.32% (1-0.5968)*100% to be efficient. DMU9 was variable in terms of its efficiency though near to efficient in 2015(95.1%).

In terms of average efficiency score , non of decision making units was perfectly efficient for the last decade but DMU1 (98.63%) and DMU5(97.47%) were near to efficient. DMU7 and DMU8 had high efficiency(94.25% and 90.37% respectively). DMU2, DMU3, DMU4 DMU6 and DMU8 could increase their output on average by 20.98%, 21.31% , 21.25% ,23.94% and 10.26% respectively to be efficient. As a result managers or decision makers with the help of efficiency scores should see the situation of their respective insurance companies.

Table 4 shows efficiency score of decision making units in variable returns scale. Variable returns scale could operate when optimal conditions (constant returns scale) could not exist. This might happen when there would be policy discrimination, government intervention and other remaining cases.

Table 4: BCC Efficiency Scores (2006-2015)

DMU	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	average	rank
Dmu1	1	1	1	1	1	1	1	1	1	1	1	1
DMU2	1	.7579	.8771	.9267	.8865	.8113	.8264	.6837	.8302	.8684	0.8468	6
DMU3	.5773	1	1	1	1	.5838	.6704	.5655	1	1	0.8397	7
DMU4	.9867	.7109	.7984	.9238	1	.9407	.9385	.6909	.8672	.8467	0.8304	8
DMU5	1	.9767	1	1	1	1	1	.6953	1	1	0.9672	2
DMU6	1	1	.6876	.7700	.7175	.7272	.8076	1	.7903	.7545	0.8255	9
DMU7	1	.9981	1	1	.9088	1	1	1	1	.6537	0.9561	3
DMU8	1	.9434	.8959	1	.9849	1	1	.7947	.8310	.7119	0.9162	5
DMU9	.9987	1	1	.9637	.9112	.8568	.8882	.7492	.8318	.9788	0.9178	4

In literature BCC efficiency scores are called as technical or pure technical scores. This score is consisted of BCC efficiency scores, therefore the number of technical efficient companies is higher than the number of total efficient companies.

DMU1 (Ethiopia insurance company which is governmental) was best insurance, 100% efficient in terms of gross written premium and net profit after tax. DMU2 was inefficient except in 2006 while DMU3 was efficient in the last two consecutive years(2014 and 2015). Each decision making units(DMU) were not consistent in terms of their efficiency score where each of them were 100% efficient at least twice and inefficient in all other times.

On average only DMU1 was perfectly efficient and was a reference for all other firms. DMU5, DMU7, DMU8 and DMU9 were nearly efficient (96.72%, 95.61%, 91.62% and 91.78% efficient respectively).

Table 5: Scale Efficiency Scores (2006-2015)

DMU	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	rank
Dmu1	0.8542	1.000	0.9172	1.000	1.000	1.000	1.000	1.00	1.000	1.000	0.9771	3
DMU 2	0.8247	0.9445	1.000	0.4259	0.9740	0.9862	0.9525	0.9781	0.8977	0.8994	0.8883	7
DMU 3	1.000	0.9869	0.9309	0.1957	0.8307	1.000	1.000	1.000	0.8024	0.8520	0.8598	8
DMU 4	0.7058	0.8500	1.000	0.2033	1.000	0.9853	0.9060	0.9138	0.8684	0.8820	0.8315	9
DMU 5	1.000	0.7645	0.9937	0.8516	1.000	1.000	1.000	1.000	1.000	1.000	0.9610	5
DMU 6	1.000	1.000	1.000	0.4441	0.9516	0.9861	0.9586	0.9147	0.8895	0.8909	0.9035	6
DMU 7	1.000	0.9552	1.000	0.9696	0.9739	1.000	1.000	1.000	1.000	0.9129	0.9812	2
DMU 8	1.000	0.9896	0.9587	.9721	0.9691	1.000	1.000	0.9691	0.9824	0.9887	0.9829	1
DMU 9	0.956	1.000	1.000	0.9115	0.9940	0.9851	0.9385	0.9897	0.9814	0.9716	0.9728	4

Table 5 presented scale efficiency of insurance companies. A measure of scale efficiency (SE) can be obtained by comparing TE measures derived under the assumptions of constant returns-to-scale (CRS) and variable returns-to-scale (VRS). The TE measure corresponding to CRS assumption represents overall technical efficiency (OTE) which measures inefficiencies due to the input/output configuration and as well as the size of operations. The efficiency measure corresponding to VRS assumption represents pure technical efficiency (PTE) which measures inefficiencies due to only managerial underperformance. The relationship is SE = OTE /PTE provides a measure of scale efficiency [12].

Scale efficiency scores help to decision makers so as to understand the reason of inefficiency in CCR model. If a decision making unit is inefficient according to CCR model, while BBC efficiency score is 100%, it can be said that inefficiency derive from scale inefficiency. Based on this although DMU1 is efficient in BCC(variables returns scale) model, it was scale inefficient in 2006 and 2008 which was due CCR(constant returns to scale).

As shown in table 5 all DMUs were scale inefficient on average but 6 insurance companies had scale efficiency of 90% and above while 3 other insurance companies had scale efficiency of less than 90%.

Taking the recent year 2015, DMU1 and DMU5 were 100% efficient and were best peers for other DMUs. DMU2 had input slack values of 9.01404 for total asset and $7.18*10^7$ for total expense . This means to be efficient, it could reduce total asset by 9.01404 ETB and total expense by $7.18*10^7$ ETB. Similarly This decision making unit had output slacks of net profit (5968241) showing that DMU2 could increase its net profit by 5968241ETB to be efficient. DMU3 had input slack on total asset ($6.03*10^7$) implying that it could decrease its total asset by $6.03*10^7$ ETB to be efficient. In addition DMU4 had input slack of total asset and total expense (7.92029& $4.45*10^7$ respectively) and output slack of net profit($1.27*10^7$). One can see the appendix about slack values and reference values of each decision making units from 2006-2015.

3.3 Relationship between relative efficiency score and selected independent variables

Tobit regression analysis was used to identify factors associated with relative efficiency score of insurance company. The tobit model, also called a censored regression model, is designed to estimate linear relationships between variables when there is either left- or right-censoring in the dependent variable (also known as censoring from below and above, respectively). Censoring from above takes place when cases with a value at or above some threshold, all take on the value of that threshold, so that the true value might be equal to the threshold, but it might also be higher. In the case of censoring from below, values those that fall at or below some threshold are censored.

Table 6 shows stata output of efficiency score as dependent variable with independent variables(leverage, insurance size, number of branches of each insurance company, and age of each insurance company).

Table 6: Tobit regression output

Tobit regression			Number of observation			90
			LR chi2(4)			17.95
			Prob>chi2			0.0013
Log likelihood		-13.8377	Pseudo R^2			0.3934
Efficiency	Coef	Std.err	t	P>|t|	95% conf.	Interval
Leverage	0.1142	0.2728	0.42	0.676	-0.428	0.6565
Size	-0.1324	0.0404	3.28	0.002	-0.2128	-0.0520
Age	0.0091	0.0050	1.84	0.070	-0.0008	0.0190
Nbranches	0.010	0.0041	2.46	0.016	0.0019	0.0183
Constant	3.038	0.6725	4.52	0.000	1.7010	4.375
Sigma	0.1837	0.0206			0.1426	0.2247

In the top of the output we have log likelihood= -13.8377 which is used in likelihood ratio chi-square test of whether all predictor coefficients are zero or not. LR chi2(4) =17.95 and prob>chi2=0.0013(which is p-value) help us to test whether the overall model is significant or not or it helps us to test the null hypothesis of all coefficients of predictors are zero with an alternative hypothesis of at least one coefficient is different from zero. Since the p-value=0.0013 is less than 5%, we can say that the model is significant and better than empty model(a model with no predictor variable).

From the output, there was zero left censored observations implying that there was no any insurance company which efficiency score is less than or equal to 0.5 since the threshold hold value for lower limit was specified to be 0.5 in the command. We had 48 right censored observations showing that there were 48 efficiency scores with the value greater than or equal to 1 since the threshold value for upper limit was specified as to be 1 in the command. Sigma=0.1837 is the estimated standard error of tobit regression.

The result shows us size and number of branches of insurance company were significantly affecting efficiency score at 95% confidence and age of insurance company was affecting efficiency score at 90% confidence but leverage value was not significantly affecting efficiency score.

Size of insurance company was negatively affecting efficiency score which contradicts the research hypothesis and literature. This may be due to as the size of insurance company increased, the risk of each insurance also increased which in turn decreases net profit and gross written premium. As Size of each insurance company increases by one unit, efficiency score decreases approximately 0.13 keeping the effect of other predictor constant. Number of branches were positively affecting. As the number of branches of insurance company increases by one, efficiency score of each insurance company increases approximately by 0.01 keeping the effect of other companies constant.

4. Conclusion and recommendation

4.1 Conclusion

Among many available methods of measuring operational efficiency ranging from parametric models, the DEA model employed in this study is a very superior method of measuring relative operational efficiency. This is because apart from its multivariable ability usage in terms of inputs and outputs, it also provides useful information which enables organizations to solve challenges like resource allocation, performance targets-setting, and identifying best operational business practices. Therefore, organizations which apply scientific methods in their business management gain distinctive competitive advantage over their peers.

This study used nine insurance companies which were operating from 2006-2015. Data were obtained from financial statement of insurance companies. Two input variables (total asset and total expense) and two output variables(net profit after tax and gross written premium) were used in data envelopment analysis model.

Correlation analysis, over all technical efficiency (crs) , pure technical efficiency (vrs) and scale efficiency were used to measure the relative efficiency of each insurance companies. Tobit regression model was also used to identify factors affecting efficiency score of insurance companies.

Based on the result there was strong and positive significant correlation between input and output variables which was essential requirement for Dea. Ethiopian insurance corporation(DMU1) was efficient and was best peer in maximizing net profit and gross premium. It had no slack (left over) values. This could be it is being governmental and most governmental organizations are insured by it. Nyala insurance company took the second position in terms of efficiency and it was second most efficient and best peer insurance company in the country. Nile insurance company(DMU6) was the least efficient company even though it was efficient in 2006 & 2007. United insurance company(DMU7) was third best peer company in maximizing its profit and premium. The remaining insurance companies were not consistent in terms of their efficiency to maximize their profit in particular they failed to be efficient in recent years.

Size of insurance companies and number of branches of insurance company were significantly affecting efficiency score of insurance companies. Efficiency score was negatively affected by company size and was positively affected by number of branches. Most of insurance companies except Ethiopian and Nyala insurance companies had at least one slack values (left over values) more frequently that hindered insurance companies to be 100% efficient. See appendix 4.1-4.10.

4.2 Recommendation

Based on the findings of this study the following recommendations were suggested.

- Each insurance company should operate consistently to maximize net profit and gross premium. Because none of the 9 insurance companies was 100% efficient on average in scale and overall efficiency score
- Governmental organizations should be insured by private insurance companies. This is because Ethiopian insurance company which is governmental was relatively best firm.
- Each insurance company should decrease total expense and asset values and increase net profit and gross premium according to the result depicted in appendixes
- Each insurance company should decrease their size. Because each company size was negatively affecting efficiency score.
- Insurance should increase its branches to be efficient because number of branches was positively affecting efficiency score.

Acknowledgement

We would like to thank Ethiopian Insurance companies for giving us the required data.

Reference

[1]. Udaibir S.Das, N. D. (July, 2003). Insurance and Issues in financial soundness. IMF,monetary and finance department.

[2]. UNCTAD. (2007).

[3]. Hammoud, V. a. (2008). promoting the growth and competitiveness of the insurance sector in Arab World. Makati city; Philippines.

[4]. Ward and Zurbregg, W. (2000). Does Insurance promote Economic Growth?evidence from OECD countries. The journal of Risk and Insurance, , pp.489-506.

[5]. Hailu. (Aug.2007). Insurance in Ethiopia,historical development,present status & future Challenges.

[6]. Podpiera, N. D. (2003). Insurance and Issues in Financial Soundness. IMF Working Paper, WP/03/138 .

[7]. NOREEN, A. K. (2014, May). Efficiency Measure of Insurance v/s Takful Firms Using DEA. Islamic Economic Studies , Vol. 22, No. 1,, pp. 139-158.

[8]. Manaleg. (2008). The effect of human resource performance management on efficiency: the case of EIC. Addis Ababa.

[9]. Commins, J. a. (1998). comparison of frontier efficiency methods: An application to the U.S.life insurance industry. journal of productivity analysis .

[10]. sisay, M. (2015). The Determinants of Profitability on Insurance Sector: Evidence from Insurance Companies in Ethiopia. thesis, Addis Ababa, Ethiopia.

[11]. MWANGETI, N. T. (2012). MEASURING OPERATIONAL EFFICIENCY OF THE INSURANCE

INDUSTRY IN KENYA USING DATA ENVELOPMENT ANALYSIS. research, Nirobi

[12]. Webb, b. a. (2002). Determinants of life insurance consumption across countries:. washington D.C: World Bank and international foundation.

[13]. Charnes, A. C. (1978). Measuring the Efficiency of Decision Making Units. European Journal of Operational Research 2(6), 429-444 .

[14]. R.D Banker, A. charnes, W.W Cooper(1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis.

5. Appendix

Appendix 4.1 Input-output result of DMU in 2006

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	6	.854258	.	.	.	.	.	.29135	.74188	.204897	.
dmu:2	7	.824689	.	.	.	.	.40007	.	.241423	.208616	.
dmu:3	9	.57728	.	.	.	.	.0051058	.	.186073	.0308928	.
dmu:4	8	.69646	.	.	.	.	.798	.	.953847	.	.
dmu:5	4	1	.	.	.	.	1	.	0	0	.
dmu:6	1	1	.	.	.	.	.	1	0	0	.
dmu:7	1	1	.	.	.	.	.	.	1	0	.
dmu:8	1	1	.	.	.	.	0	.	0	1	.
dmu:9	5	.954815	.	.	.	.	.	.0720784	.180404	.477384	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	.	.	.	36.3554
dmu:2	.	6.17577		
dmu:3	.	0	.	.
dmu:4	.	0	108990	.
dmu:5	.	5.96e-08	.	.
dmu:6	.	.	.	0
dmu:7	0	.	.	0
dmu:8	.	0	.	.
dmu:9	.	.	.	0

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

ref: ref: ref: ref: ref: ref: ref: ref: ref:

	rank	theta	1	2	3	4	5	6	7	8	9
dmu:1	1	1	1	.	.	.	.	0	.	0	.
dmu:2	1	1	.	1	.	.	0	.	0	0	.
dmu:3	9	.57728	.	.	.	.	.0051058	.	.186073	.0308928	.
dmu:4	8	.986748	.11092	.875828	.	.	.	.	4.08e-07	.	.
dmu:5	6	1	.	.	.	.	1	.	0	0	.
dmu:6	1	1	.	.	.	.	.	1	0	0	.
dmu:7	1	1	.	.	.	.	.	.	1	0	.
dmu:8	1	1	.	.	.	.	0	.	0	1	.
dmu:9	7	.998716	.	.	.	.	.	.	.201636	.553865	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	0
dmu:2	.	0	.	.
dmu:3	.	0	.	.
dmu:4	.	5857839	2927910	.
dmu:5	.	5.96e-08	.	.
dmu:6	.	.	.	0
dmu:7	0	.	.	0
dmu:8	.	0	.	.
dmu:9	4227328	.	.	1646643

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	0.854258	1.000000	1.000000	0.854258	-1.000000
dmu:2	0.824689	1.000000	1.000000	0.824689	-1.000000
dmu:3	0.577280	0.577280	0.577280	1.000000	0.000000

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	.	0	.	0	.
dmu:2	1	1	.	1	.	.	0	.	0	0	.
dmu:3	9	.57728	.	.	.	.	.0051058	.	.186073	.0308928	.
dmu:4	8	.986748	.11092	.875828	.	.	.	.	4.08e-07	.	.
dmu:5	6	1	.	.	.	.	1	.	0	0	.
dmu:6	1	1	.	.	.	.	.	1	0	0	.

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:7	1	1	.	.	.	.	.	.	1	0	.
dmu:8	1	1	.	.	.	.	0	.	0	1	.
dmu:9	7	.998716	.	.	.	.	.	.	.201636	.553865	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	0
dmu:2	.	0	.	.
dmu:3	.	0	.	.
dmu:4	.	5857839	2927910	.
dmu:5	.	5.96e-08	.	.
dmu:6	.	.	.	0
dmu:7	0	.	.	0
dmu:8	.	0	.	.
dmu:9	4227328	.	.	1646643

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	0.854258	1.000000	1.000000	0.854258	-1.000000
dmu:2	0.824689	1.000000	1.000000	0.824689	-1.000000
dmu:3	0.577280	0.577280	0.577280	1.000000	0.000000

Appendix 4.2 Input-output result of DMU in 2007

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	.	.	.	.	0
dmu:2	8	.715809	.03890	.	.	.	.	.421636	.	.	.440831
dmu:3	4	.986869	.0305227	.	.	.	.	1.46e-09	.	.	.
dmu:4	9	.611408	.113368	.	.	.	.	.729377	.	.	.
dmu:5	7	.746696	.0054807	.	.	.	.	.26356	.	.	.133308
dmu:6	1	1	.	.	.	.	.	1	.	.	.
dmu:7	5	.95343	.0750425	.	.	.	.	.172244	.	.	.257822
dmu:8	6	.933615	.0137671	.	.	.	.	.	.	.	.964021
dmu:9	1	1	0	.	.	.	.	0	.	.	1

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium

dmu:1 0 . . 0

dmu:2 6.59377 . . .

dmu:3 1.24e+07 . 266841 .

dmu:4 7.67101 . 4301463 .

dmu:5 1.57904 . . .

dmu:6 . 0 0 0

dmu:7 .874183 . . .

dmu:8 8.45212 . . 592480

dmu:9 0 . . .

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

ref: ref: ref: ref: ref: ref: ref: ref: ref:

rank theta 1 2 3 4 5 6 7 8 9

dmu:1 1 1 1 0

dmu:2 8 .757955 .0736654 . . . . .443485 . . .240805

dmu:3 4 1 .0299795 . . . . .0027222 . . .

dmu:4 9 .710948 .14622 . . . . .564728 . . .

dmu:5 6 .976706 . . . . . .433347 . . .101262

dmu:6 1 1 0 . . . . 1 . . .

dmu:7 5 .998126 .0592297 . . . . .162304 . . .348828

dmu:8 7 .943436 .021359 . . . . 1.25e-07 . . .922076

dmu:9 1 1 0 . . . . 0 . . 1

islack: islack: oslack: oslack:

Totalasset expense nprofit primium

dmu:1 0 . . 0

dmu:2 . 5605307 . 0

dmu:3 1.32e+07 . 247444 .

dmu:4 5.3062 1.13e+07 5474679 .

dmu:5 1.02e+07 . . 9199991

dmu:6 0 . 0 .

dmu:7 6990166 . . .

dmu:8 . 1264616 . 338995

dmu:9 0 . . .

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.715809	0.757955	1.000000	0.944395	1.000000
dmu:3	0.986869	1.000000	1.000000	0.986869	1.000000

dmu:4	0.611408	0.710948	1.000000	0.859990	1.000000
dmu:5	0.746696	0.976706	0.746696	0.764505	1.000000
dmu:6	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:7	0.953430	0.998126	0.953430	0.955220	1.000000
dmu:8	0.933615	0.943436	1.000000	0.989590	1.000000
dmu:9	1.000000	1.000000	1.000000	1.000000	0.000000

Annex 4.3 Input-output result of DMU in 2008

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

			ref:	ref:	ref:	ref:	ref:	ref:	ref:	ref:	ref:
	rank	theta	1	2	3	4	5	6	7	8	9
dmu:1	1	1	1	.	0	.	.	.	.	.	0
dmu:2	7	.804454	.	.	.	.	.491559	.	.806971	.	.
dmu:3	1	1	0	.	1	.	.	.	.	.	.
dmu:4	8	.743228	.0236946	.	.	.	.	.	.949658	.	0
dmu:5	1	1	.	.	.	.	1	.	0	.	.
dmu:6	9	.683265	.092947	.	.	.	.	.	.611445	.	8.67e-06
dmu:7	1	1	.	.	.	.	0	.	1	.	.
dmu:8	6	.858933	.	.	.	.	.0627872	.	.95186	.	.
dmu:9	1	1	.	.	.	.	.	.	.	.	1

	islack:	islack:	oslack:	oslack:
	Totalasset	expense	nprofit	primium
dmu:1	0	.	.	.
dmu:2	.	1.20861	1125663	.
dmu:3	0	.	0	.
dmu:4	.	.	9915690	.
dmu:5	.	0	0	.
dmu:6	.	.	4385185	.
dmu:7	.	0	0	.
dmu:8	.	6.66852	4715214	.
dmu:9	0	0	.	0

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

			ref:	ref:	ref:	ref:	ref:	ref:	ref:	ref:	ref:
	rank	theta	1	2	3	4	5	6	7	8	9
dmu:1	1	1	1	.	0	.	.	.	.	.	0
dmu:2	7	.877073	.0324863	.	.	.	.	.	.844587	.	0

dmu:3	1	1	0	.	1	.	.	.	.	.	.
dmu:4	8	.798421	.0679177	.	.	.	.	.	.730507	.	0
dmu:5	1	1	.	.	.	.	1	.	0	.	.
dmu:6	9	.68761	.0971918	.	.	.	.	.	.590415	.	3.27e-06
dmu:7	5	1	.	.	.	.	0	.	1	.	.
dmu:8	6	.895896	.0205609	.	.	.	.	.	.875338	.	0
dmu:9	1	1	.	.	.	.	.	.	.	.	1

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	.
dmu:2	.	1.05e+07	2543585	.
dmu:3	0	.	0	.
dmu:4	.	6063843	9953482	.
dmu:5	.	0	0	.
dmu:6	.	521728	4388780	.
dmu:7	.	7.45e-09	9.31e-10	.
dmu:8	.	3656937	4910338	.
dmu:9	0	0	.	0

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.804454	0.877073	1.000000	0.917203	-1.000000
dmu:3	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:4	0.743228	0.798421	1.000000	0.930872	1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.683265	0.687610	0.784858	0.993681	1.000000
dmu:7	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:8	0.858933	0.895896	1.000000	0.958742	-1.000000
dmu:9	1.000000	1.000000	1.000000	1.000000	0.000000

Annex 4.4 Input-output result of DMU in 2009

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	0	.	.	.	.	0	.
dmu:2	7	.926738	.0508395	.	.	.	.348003	.	.527896	.	.

dmu:3	5	1	.	.	1	.	.	.	.	0	.
dmu:4	8	.923815	.14738	.	.	.	.708058	.	.	.	.
dmu:5	1	1	0	.	.	.	1	.	.	0	.
dmu:6	9	.769969	.0449813	.	.	.	1.75e-06	.	.724986	.	.
dmu:7	1	1	0	.	.	.	0	.	1	.	.
dmu:8	4	1	.	.	.	.	.	.	.	1	.
dmu:9	6	.963668	.0414554	.	.	.	.362732	.	.559481	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	.
dmu:2	.	45.5175	961100	.
dmu:3	0	.	.	2.94e-08
dmu:4	2390391	.	6666872	.
dmu:5	0	.	.	.
dmu:6	.	997029	2746787	.
dmu:7	.	0	0	.
dmu:8	0	1.49e-08	.	7.45e-09
dmu:9	.	15.4699	4154333	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.00000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.910866	0.926738	0.934774	0.982873	-1.000000
dmu:3	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:4	0.915934	0.923815	1.000000	0.991468	1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.737614	0.769969	1.000000	0.957979	-1.000000
dmu:7	0.990251	1.000000	1.000000	0.990251	-1.000000
dmu:8	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:9	0.927000	0.963668	1.000000	0.961950	-1.000000

Annex 4.5 Input-output result of DMU in 2010

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	0	.	.	.	.	.
dmu:2	7	.863528	.0044847	.	.	.513736	1.05824	.	.	.	.
dmu:3	8	.830742	.0147789	.	.	.0622897	.	.	.	.	.
dmu:4	1	1	0	.	.	1	.	.	.	.	.

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:5	1	1	0	.	.	.	1	.	.	.	.
dmu:6	9	.682827	.140515	.	.	.0261443	1.05674	.	.	.	.
dmu:7	6	.885088	.101636	.	.	.155399	1.19289	.	.	.	.
dmu:8	4	.954456	.0835463	.	.	.281809	.373435	.	.	.	.
dmu:9	5	.905737	.0074782	.	.	.721226	.341977	.	.	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	0	.	.
dmu:2	.	0	.	.
dmu:3	2.01e+07	0	.	.
dmu:4	0	0	.	.
dmu:5	.	0	0	.
dmu:6	.	0	.	.
dmu:7	.	37.646	.	.
dmu:8	.	0	.	.
dmu:9	.	0	.	.

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	0	.	.	.	.	.
dmu:2	8	.886559	.0899151	.	.	.263794	.532849	.	.	.	.
dmu:3	4	1	.0147789	.	.	.0622897	.	.	.	.	.
dmu:4	1	1	0	.	.	1	.	.	.	.	.
dmu:5	1	1	0	.	.	.	1	.	.	.	.
dmu:6	9	.717526	.186308	.	.	.	.531219	.	.	.	.
dmu:7	7	.908816	.164284	.	.	.	.744532	.	.	.	.
dmu:8	5	.984906	.144268	.	.	.104157	.	.	.	.	.
dmu:9	6	.911181	.0272291	.	.	.663442	.220511	.	.	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	0	.	.
dmu:2	.	1.71e+07	.	.
dmu:3	3.04e+07	1403425	.	.
dmu:4	0	0	.	.
dmu:5	.	0	0	.

dmu:6	.	1.58e+07	2617060	.
dmu:7	.	1.42e+07	676865	.
dmu:8	2167931	1.24e+07	.	.
dmu:9	.	3840137	.	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.863528	0.886559	1.000000	0.974022	-1.000000
dmu:3	0.830742	1.000000	1.000000	0.830742	1.000000
dmu:4	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.682827	0.717526	1.000000	0.951641	-1.000000
dmu:7	0.885088	0.908816	1.000000	0.973891	-1.000000
dmu:8	0.954456	0.984906	0.954456	0.969084	1.000000
dmu:9	0.905737	0.911181	0.934019	0.994026	-1.000000

Annex 4.6 Input-output result of DMU in 2011

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	.	.	0	0	.
dmu:2	7	.800086	.199638	.	.	.	.0926402	.	4.56e-07	.	.
dmu:3	9	.583823	.	.	.	.	.197856	.	.0688331	.	.
dmu:4	5	.926936	.155865	.	.	.	.	.	8.15e-07	.221422	.
dmu:5	4	1	.	.	.	.	1	.	0	.	.
dmu:6	8	.717106	.154879	.	.	.	1.01389	.	.0723693	.	.
dmu:7	1	1	.	.	.	.	.	.	1	.	.
dmu:8	1	1	.	.	.	.	.	.	0	1	.
dmu:9	6	.844051	.133038	.	.	.	.	.	1.55e-07	.220734	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	.	0	.	.
dmu:2	.	6821332	.	.
dmu:3	.	0	58174.9	.
dmu:4	.	2.05e+07	.	.
dmu:5	.	7.45e-09	1.86e-09	.

dmu:6	.	0	.	.
dmu:7	0	0	0	.
dmu:8	.	0	.	0
dmu:9	.	1.07e+07		

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

			ref:	ref:	ref:	ref:	ref:	ref:	ref:	ref:	ref:
	rank	theta	1	2	3	4	5	6	7	8	9
dmu:1	1	1	1	.	.	.	.	.	0	0	.
dmu:2	7	.811304	.14279	.	.	.	.199659	.	.220942	.	.
dmu:3	9	.583823	.	.	.	.	.197856	.	.0688331	.	.
dmu:4	5	.940748	.102126	.	.	.	.	.	.305581	.12559	.
dmu:5	4	1	.	.	.	.	1	.	0	.	.
dmu:6	8	.727202	.208814	.	.	.	.518388	.	0	.	.
dmu:7	1	1	.	.	.	.	.	.	1	.	.
dmu:8	1	1	.	.	.	.	.	.	0	1	.
dmu:9	6	.856794	.0850636	.	.	.	.	.	.272805	.135181	.

	islack:	islack:	oslack:	oslack:
	Totalasset	expense	nprofit	primium
dmu:1	.	0	.	.
dmu:2	.	1.94e+07	.	.
dmu:3	.	0	58174.9	.
dmu:4	.	4.21e+07	.	.
dmu:5	.	7.45e-09	1.86e-09	.
dmu:6	.	9982146	3721483	.
dmu:7	0	0	0	.
dmu:8	.	0	.	0
dmu:9	.	2.99e+07	.	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.800086	0.811304	0.807396	0.986174	1.000000
dmu:3	0.583823	0.583823	1.000000	1.000000	0.000000
dmu:4	0.926936	0.940748	1.000000	0.985318	1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.717106	0.727202	1.000000	0.986116	-1.000000
dmu:7	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:8	1.000000	1.000000	1.000000	1.000000	0.000000

dmu:9 0.844051 0.856794 0.865128 0.985127 1.000000

Annex 4.7 Input-output result of DMU in 2012

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	0	.	.
dmu:2	7	.78721	.0174756	.	.	.	2.33765	.	.	.	.
dmu:3	9	.670386	1.82e-08	.	.	.	.434259	.	.	.	.
dmu:4	5	.850372	.	.	.	.	1.94708	.	.0585051	.0017967	.
dmu:5	1	1	.	.	.	.	1	.	0	0	.
dmu:6	8	.774199	4.58e-08	.	.	.	2.70743	.	.	.	.
dmu:7	1	1	.	.	.	.	.	.	1	0	.
dmu:8	1	1	.	.	.	.	0	.	.	1	.
dmu:9	6	.833602	.	.	.	.	1.37381	.	.0793709	.202759	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	.
dmu:2	.	13.8641	7481202	.
dmu:3	.	3259502	6448805	.
dmu:4	0	.	.	.
dmu:5	0	.	.	.
dmu:6	.	9220999	2.51e+07	.
dmu:7	0	.	.	0
dmu:8	.	0	.	0
dmu:9	17.044	.	.	.

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	0	.	.
dmu:2	7	.826436	.158086	.	.	.	.615848	.	.	.0525013	.
dmu:3	9	.670386	1.82e-08	.	.	.	.434259	.	.	.	.
dmu:4	5	.938539	.0958534	.	.	.	.543551	.	.	.299135	.
dmu:5	1	1	.	.	.	.	1	.	0	0	.
dmu:6	8	.807611	.177617	.	.	.	.629994	.	.	.	.
dmu:7	1	1	.	.	.	.	.	.	1	0	.

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:8	1	1	.	.	.	.	0	.	.	1	.
dmu:9	6	.888229	.0748694	.	.	.	.40324	.	.	.41012	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	.
dmu:2	4.07394	4.51e+07	.	.
dmu:3	.	3259502	6448805	.
dmu:4	13.9156	3.68e+07	.	.
dmu:5	0	.	.	.
dmu:6	.	6.28e+07	1.45e+07	.
dmu:7	0	.	.	0
dmu:8	.	0	.	0
dmu:9	14.498	2.10e+07	.	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.787210	0.826436	1.000000	0.952536	-1.000000
dmu:3	0.670386	0.670386	1.000000	1.000000	0.000000
dmu:4	0.850372	0.938539	1.000000	0.906059	-1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.774199	0.807611	1.000000	0.958629	-1.000000
dmu:7	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:8	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:9	0.833602	0.888229	0.922730	0.938499	-1.00000

Annex 4.8 Input-output result of DMU in 2013

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	.	.	.
dmu:2	6	.66873	.143123	.	.	.	.386343	.	.	.	.
dmu:3	9	.56554	.0122029	.	.	.	.0653353	.	.061872	.	.
dmu:4	8	.631365	.11825	.	.	.	.107596	.	.	.	.
dmu:5	1	1	.	.	.	.	1	.	0	.	.
dmu:6	7	.636109	.151855	.	.	.	0	.	.	.	.
dmu:7	1	1	.	.	.	.	0	.	1	.	.
dmu:8	4	.770173	.0480912	.	.	.	.232981	.	.352719	.	.
dmu:9	5	.741512	.0566285	.	.	.	.396887	.	.241026	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	.	0	0	.
dmu:2	.	4092314	0	.
dmu:3	0	.	.	.
dmu:4	.	8628690	7.15662	.
dmu:5	0	.	.	0
dmu:6	.	2.93e+07	6105106	.
dmu:7	0	.	.	0
dmu:8	0	.	.	.
dmu:9	0	.	.	.

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	.	.	.
dmu:2	8	.683681	.131481	.	.	.	.5522	.	.	.	.
dmu:3	9	.56554	.0122029	.	.	.	.0653353	.	.061872	.	.
dmu:4	7	.690901	.0831428	.	.	.	.607759	.	.	.	.
dmu:5	1	1	.	.	.	.	1	.	0	.	.
dmu:6	6	.695389	.110823	.	.	.	.584566	.	.	.	.
dmu:7	1	1	.	.	.	.	0	.	1	.	.
dmu:8	4	.794724	.0516912	.	.	.	.23501	.	.328598	.	.
dmu:9	5	.749239	.0581093	.	.	.	.397722	.	.231105	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	.	0	0	.
dmu:2	.	1477934	1.83e+07	.
dmu:3	0	.	.	.
dmu:4	.	1008779	5.50e+07	.
dmu:5	0	.	.	0
dmu:6	4.02316	2.19e+07	7.04e+07	.
dmu:7	0	.	.	0
dmu:8	1.51e+07	.	.	.
dmu:9	5231098	.	.	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

CRS_TE VRS_TE NIRS_TE SCALE RTS

dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.668730	0.683681	0.700968	0.978132	1.000000
dmu:3	0.565540	0.565540	0.565540	1.000000	0.000000
dmu:4	0.631365	0.690901	0.725465	0.913828	1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.636109	0.695389	1.000000	0.914752	1.000000
dmu:7	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:8	0.770173	0.794724	0.770173	0.969108	1.000000
dmu:9	0.741512	0.749239	0.741512	0.989686	1.000000

Annex 4.9 Input-output result of DMU in 2014

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	0	.	.
dmu:2	8	.745316	.188582	.	.	.	.	.	.	.	.
dmu:3	6	.802369	.	.	.	.	.118154	.	.143716	.	.
dmu:4	7	.753133	.159542	.	.	.	.	.	.	.	.
dmu:5	1	1	.	.	.	.	1	.	0	.	.
dmu:6	9	.703013	.167842	.	.	.	.	.	.	.	.
dmu:7	1	1	.	.	.	.	0	.	1	.	.
dmu:8	4	.816398	.0408146	.	.	.	.442396	.	.363917	.	.
dmu:9	5	.81635	.0747708	.	.	.	.321162	.	.252335	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	.
dmu:2	13.1125	2.41e+07	394755	.
dmu:3	13.4551	.	.	4536646
dmu:4	10.758	6155759	7869917	.
dmu:5	0	.	.	0
dmu:6	5.09965	4.01e+07	1.94e+07	.
dmu:7	0	.	.	0
dmu:8	0	.	.	.
dmu:9	0	.	.	.

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

ref: ref: ref: ref: ref: ref: ref: ref: ref:

	rank	theta	1	2	3	4	5	6	7	8	9
dmu:1	1	1	1	.	.	.	0	.	0	.	.
dmu:2	8	.830236	.188582	.	.	.	.	.	.	.	.
dmu:3	4	1	.0081375	.	.	.	.121931	.	.083079	.	.
dmu:4	5	.867266	.159543	.	.	.	.	.	.	.	.
dmu:5	1	1	.	.	.	.	1	.	0	.	.
dmu:6	9	.790321	.167842	.	.	.	.	.	.	.	.
dmu:7	1	1	.	.	.	.	0	.	1	.	.
dmu:8	7	.830998	.0440905	.	.	.	.440409	.	.346498	.	.
dmu:9	6	.831822	.0785631	.	.	.	.318863	.	.232171	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	.	.	.
dmu:2	4.92e+07	4.36e+07	394755	.
dmu:3	5.03e+07	.	.	.
dmu:4	5.54e+07	2.59e+07	7869917	.
dmu:5	0	.	.	0
dmu:6	4.78e+07	6.12e+07	1.94e+07	.
dmu:7	0	.	.	0
dmu:8	1.23e+07	.	.	.
dmu:9	1.29e+07	.	.	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.745316	0.830236	0.885421	0.897716	1.000000
dmu:3	0.802369	1.000000	1.000000	0.802369	1.000000
dmu:4	0.753133	0.867266	0.914261	0.868399	1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.703013	0.790321	1.000000	0.889529	1.000000
dmu:7	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:8	0.816398	0.830998	1.000000	0.982431	1.000000
dmu:9	0.816350	0.831822	0.816350	0.981399	1.000000

Annex 4.10 Input-output result of DMU in 2015

dea Totalasset expense = nprofit primium, ort(out)

options: RTS(CRS) ORT(OUT) STAGE(2)

CRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	.	.	.
dmu:2	5	.781113	.20482	.	.	.	.	.	.	.	.
dmu:3	4	.851995	.0290856	.	.	.	.0950324	.	.	.	.
dmu:4	6	.746811	.173627	.	.	.	.	.	.	.	.
dmu:5	1	1	0	.	.	.	1	.	.	.	.
dmu:6	8	.672175	.165852	.	.	.	.	.	.	.	.
dmu:7	9	.596801	.183385	.	.	.	.	.	.	.	.
dmu:8	7	.703901	.123866	.	.	.	.353077	.	.	.	.
dmu:9	3	.951031	.127709	.	.	.	.274446	.	.	.	.

	islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium
dmu:1	0	0	.	.
dmu:2	9.01404	7.18e+07	5968241	.
dmu:3	6.03e+07	0	.	.
dmu:4	7.92029	4.45e+07	1.27e+07	.
dmu:5	0	0	.	.
dmu:6	0	2.20e+07	1.88e+07	.
dmu:7	0	961906	1.04e+07	.
dmu:8	1.20e+08	3.30005	.	.
dmu:9	1.36e+08	0	.	

dea Totalasset expense = nprofit primium, rts(vrs) ort(out)

options: RTS(VRS) ORT(OUT) STAGE(2)

VRS-OUTPUT Oriented DEA Efficiency Results:

	rank	theta	ref: 1	ref: 2	ref: 3	ref: 4	ref: 5	ref: 6	ref: 7	ref: 8	ref: 9
dmu:1	1	1	1	.	.	.	0	.	.	.	.
dmu:2	5	.868445	.20482	.	.	.	.	.	.	.	.
dmu:3	3	1	.0290856	.	.	.	.0950324	.	.	.	.
dmu:4	6	.846713	.173627	.	.	.	.	.	.	.	.
dmu:5	1	1	0	.	.	.	1	.	.	.	.
dmu:6	7	.754498	.165852	.	.	.	.	.	.	.	.
dmu:7	9	.653716	.183385	.	.	.	.	.	.	.	.
dmu:8	8	.711927	.123866	.	.	.	.353077	.	.	.	.
dmu:9	4	.978795	.127709	.	.	.	.274446	.	.	.	.

islack: Totalasset	islack: expense	oslack: nprofit	oslack: primium

dmu:1	0	0	.	.
dmu:2	5.66e+07	1.00e+08	5968241	.
dmu:3	8.79e+07	6534540	.	.
dmu:4	5.74e+07	7.10e+07	1.27e+07	.
dmu:5	0	0	.	.
dmu:6	5.02e+07	4.27e+07	1.88e+07	.
dmu:7	4.32e+07	1.65e+07	1.04e+07	.
dmu:8	1.26e+08	1753106	.	.
dmu:9	1.52e+08	4302037	.	.

VRS Frontier(-1:drs, 0:crs, 1:irs)

	CRS_TE	VRS_TE	NIRS_TE	SCALE	RTS
dmu:1	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:2	0.781113	0.868445	1.000000	0.899439	1.000000
dmu:3	0.851995	1.000000	1.000000	0.851995	1.000000
dmu:4	0.746811	0.846713	1.000000	0.882012	1.000000
dmu:5	1.000000	1.000000	1.000000	1.000000	0.000000
dmu:6	0.672175	0.754498	1.000000	0.890890	1.000000
dmu:7	0.596801	0.653716	1.000000	0.912936	1.000000
dmu:8	0.703901	0.711927	1.000000	0.988727	1.000000
dmu:9	0.951031	0.978795	1.000000	0.971634	1.000000